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PORTAL-TO-PORTAL DUST SAMPLING PROCEDURES USED AT CBCRL

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by

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ABSTRACT

This report describes the portal-to-portal respirable mine dust sampling procedures utilized at Prince Colliery, which is operated by the Cape Breton Development Corporation (CBDC), during the period December 1985 to June 1986. These procedures will be used by the CBCRL staff for future dust surveys at CBDC mines.

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PROCÉDURES D'ÉCHANTILLONNAGE DE POUSSIÈRES D'ENTRÉE À SORTIE EN USAGE AU LRCCB

par

D.J. O'Brien*

RÉSUMÉ

Le présent rapport décrit les procédures d'échantillonnage des poussières respirables dans les mines, utilisées d'entrée à sortie dans la mine Prince Colliery, qui est opérée par la Société de Développement du Cap-Breton (SDCB), pendant la période allant de décembre 1985 à juin 1986. Ces procédures seront utilisées par les employés du LRCCB lors des futures études sur la poussière qui auront lieu dans les mines de la SDCB.

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INTRODUCTION

The long-term objective of the respirable dust research program of the Cape Breton Coal Research Laboratory (CBCRL) is to lower coal miners' occupational exposure to airborne respirable dust and thus reduce the risk of the development and progression of pulmonary disease in coal miners (1).

This report describes the portal-to-portal sampling procedures by CBCRL for measuring underground respirable mine dust. These portal-to-portal sampling procedures were used at the Prince Colliery of the Cape Breton Development Corporation (CBDC) during the period December 1985 to June 1986 (2). These procedures will be used at Lingan, Phalen Mine and Prince Colliery in the future.

INSTRUMENTATION

The instrumentation used for the portal-to-portal dust surveys which were conducted at Prince Colliery were: DuPont pump with Casella cyclone and Gillian pump with Casella cyclone. Instrumentation used for the comparison of sampling systems during the portal-to-portal survey period also included Casella gravimetric sampler, MSA pump with nylon cyclone, Gillian pump with nylon cyclone and Gillian pump with total dust cassette (see Table 1).

PORTAL-TO-PORTAL SAMPLING PROCEDURES

Portal-to-portal sampling surveys were conducted at Prince Colliery with the prior approval of mine management. Also prior to each portal-to-portal survey, management was notified and consulted as to the designated dates, times and locations of the exercise so as to have the program authorised and put in motion.

This was accomplished by carefully selecting miners who had strategic jobs on and around the longwall coalface, i.e. supervisor, shearer operator, pusher, mechanic, stageloader attendant and jackman. The reason for this was to get an overall picture from where respirable dust is present or created.

Table 1 - Field dust surveys instrumentation

Instrumentation for Surveys	Number of Units	Flow Rate of Air Sampling System (litre per minute)
SIMSLIN II Dust Monitoring System	1	0.625
Casella Gravimetric Sampler Type 113A	2	2.5
Gillian Sampler HFS 113A + Casella 4-channel Elutriator	2	2.5
Personal Sampling Systems:		
- DuPont Pump P2500A + Casella Cyclone TI3026/2	12	1.9
- MSA Fixt-Flo Pump Model I + Dorr-Oliver 10 mm Nylon Cyclone	1	2.0
- Gillian Sampler HFS 113A + Casella Cyclone T13026/2	4	1.9
- Gillian Sampler HFS 113A + Millipore 37 mm Monitor Cassette	1	2.0
Portable Anemometer AM5000	2	-
Sling Psychrometer	1	-

Personal dust samplers were then placed on this selected group of miners at the lamphouse on the surface before they entered the mine. The battery or pump was clipped on their pit belt and the cyclone pinned high on their chest, near their breathing area, so as to give an accurate reading of the respirable dust concentration taken in.

This was done in such a way as to make the miner as comfortable as could be, without interfering with his duties, and was certainly appreciated by the same. This was clearly evident by the tremendous cooperation that was given by both the miners and the management as this particular program was being carried out.

The miners wore the dust monitors from the start of the shift until the end of the shift and it was not until they returned to the surface that the monitors were shut off and returned to the CBCRL personnel looking after the exercise. Times were recorded from the start of the shift (monitor turned on) until the end of the shift (monitors turned off).

COMPARISON OF SAMPLING SYSTEMS

During the portal-to-portal surveys, two CBCRL team members went underground and conducted comparison tests of different sampling systems (see instrumentation). This comparison test was not for the duration of the shift but lasted between 60 to 250 minutes. The samplers were set up approximately 70 m outbye face (top return) or out near the deeps. The results of these tests are presented elsewhere (2). After the test, the team members returned to the surface in preparation for the return of the miners wearing the personnel samplers.

LABORATORY PROCEDURES

At the end of each survey all loaded filters were carefully brought back to the CBCRL's dust research laboratory. Samples were allowed to equilibrate for three to four hours in the laboratory in a controlled temperature and humidity environment before weighing for net mass of dust on the filters (3).

Flow rates of all samplers were measured at the laboratory before and after sampling. By using the measured net mass of the dust on the filter, flow rate of the sampler and total duration of the sampling for the shift, the mass concentration for each sample was calculated (4).

CONCLUSIONS

Portal-to-portal sampling is the best means of estimating the miner's occupational exposure to respirable dust as this procedure accounts for the miner's entire shift, including transportation to and from his working area. Portal-to-portal sampling has and will become an important part of the CBCRL respirable dust research program.

ACKNOWLEDGEMENTS

We acknowledge the invaluable help and support provided by the management and staff of the Cape Breton Development Corporation. Special thanks to those miners who were so cooperative and volunteered to wear personal samplers which were so vital in obtaining respirable dust information necessary to this report.

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